US006091037A

# United States Patent [19]

**Bachschmid**

[11] **Patent Number: 6,091,037**

[45] **Date of Patent: Jul. 18, 2000**

[54] **MINIATURE MOMENTARY CONTACT SLIDING SWITCH**

[75] Inventor: **David E. Bachschmid**, Leesburg, Va.

[73] Assignee: **BP Holdings, LLC**, Middleburg, Va.

[21] Appl. No.: **09/158,796**

[22] Filed: **Sep. 23, 1998**

**Related U.S. Application Data**

[62] Division of application No. 08/898,958, Jul. 23, 1997, Pat. No. 5,871,086, and a continuation of application No. 09/122,721, Jul. 27, 1998, which is a continuation of application No. 08/685,609, Jul. 24, 1996, abandoned.

[51] **Int. Cl.**[7] ..... **H01H 15/04**

[52] **U.S. Cl.** ..... **200/551**; 174/66; 200/330; 200/506

[58] **Field of Search** ..... 200/18, 330, 332.1, 200/338, 50.32, 50.36, 506, 519, 523, 535, 542, 551; 174/66, 67; 220/241, 242, 50.36

[56] **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 1,575,469 | 3/1926 | Waterbury . | |
| 2,521,561 | 9/1950 | Batcheller | 200/519 X |
| 2,802,074 | 8/1957 | Pass . | |
| 2,811,700 | 10/1957 | Kuch . | |
| 3,171,920 | 3/1965 | Klein et al. . | |
| 3,217,112 | 11/1965 | Campbell et al. . | |
| 3,470,339 | 9/1969 | Roman . | |
| 3,739,126 | 6/1973 | Sahrbacker et al. . | |
| 3,757,062 | 9/1973 | Lipschutz . | |
| 3,787,653 | 1/1974 | Maher . | |
| 3,839,615 | 10/1974 | Bradford . | |
| 4,017,699 | 4/1977 | Hellman . | |
| 4,180,712 | 12/1979 | Lutzenberger et al. . | |
| 4,181,838 | 1/1980 | Neuser et al. | 200/330 X |
| 4,324,958 | 4/1982 | Valleau . | |
| 4,331,844 | 5/1982 | Saitoh . | |
| 4,429,201 | 1/1984 | Dekkers et al. . | |
| 4,523,065 | 6/1985 | Heggelund | 200/509 |
| 4,704,503 | 11/1987 | Takasawa . | |
| 5,164,694 | 11/1992 | DeVault et al. . | |
| 5,914,826 | 6/1999 | Smallwood | 360/12 |

*Primary Examiner*—Renee Luebke
*Attorney, Agent, or Firm*—Whitham, Curtis & Whitham

[57] **ABSTRACT**

A sliding plate engages moveable structure such as the actuating lever of an existing wall switch and separates or connects contacts to provide a momentary contact function in a potentially very thin but robust and economical switch suitable for inclusion within a switch plate cover. Momentary contact is provided at an intermediate location between extreme positions of the actuating lever of the existing switch or other moveable structure. Additional contacts can be provided to alter switch function and/or allow discrimination of direction of movement at an intermediate location. The switch can be retrofit to any existing structure without modification of that structure or disturbance of wiring to which that structure is connected.

**7 Claims, 6 Drawing Sheets**

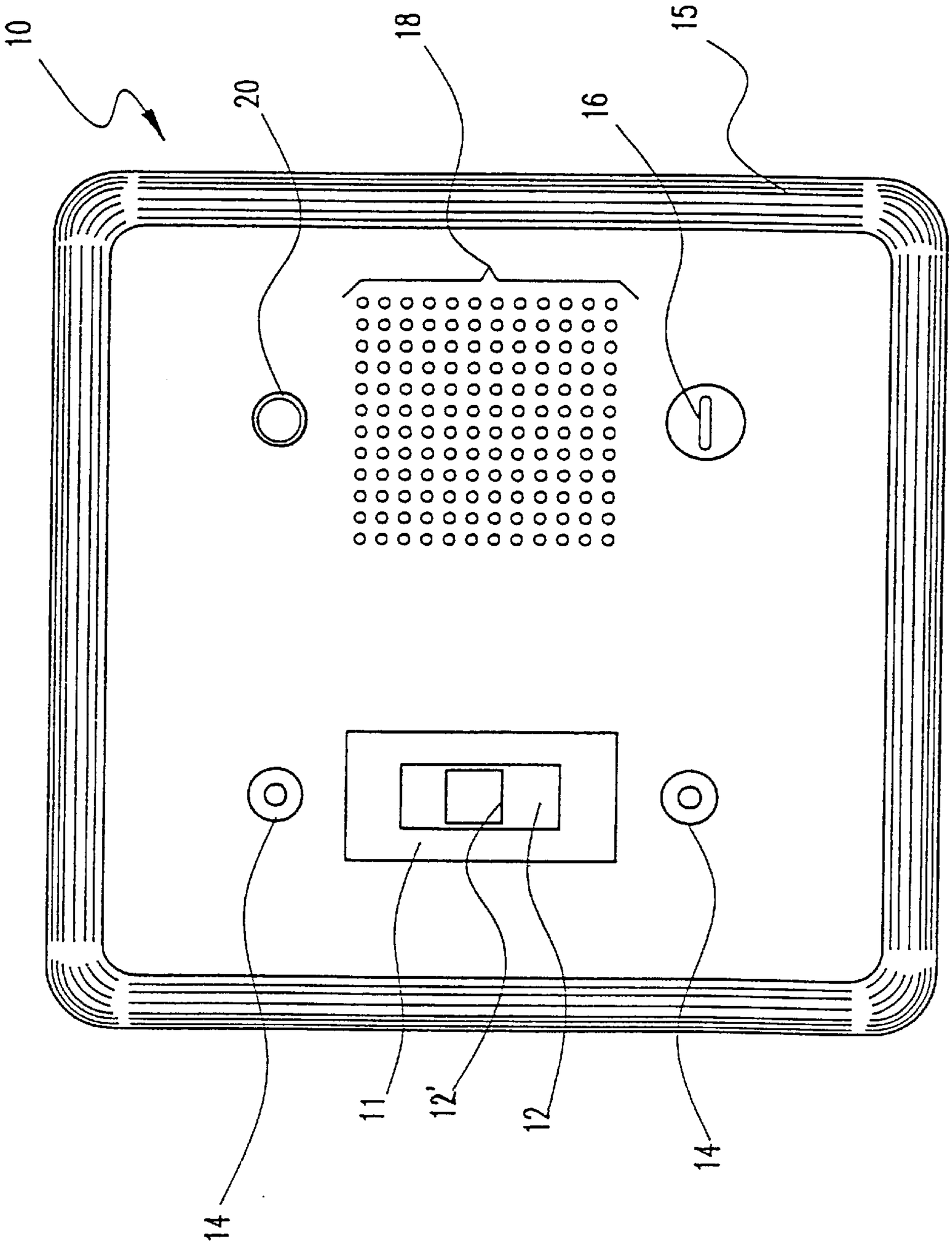


FIG.1

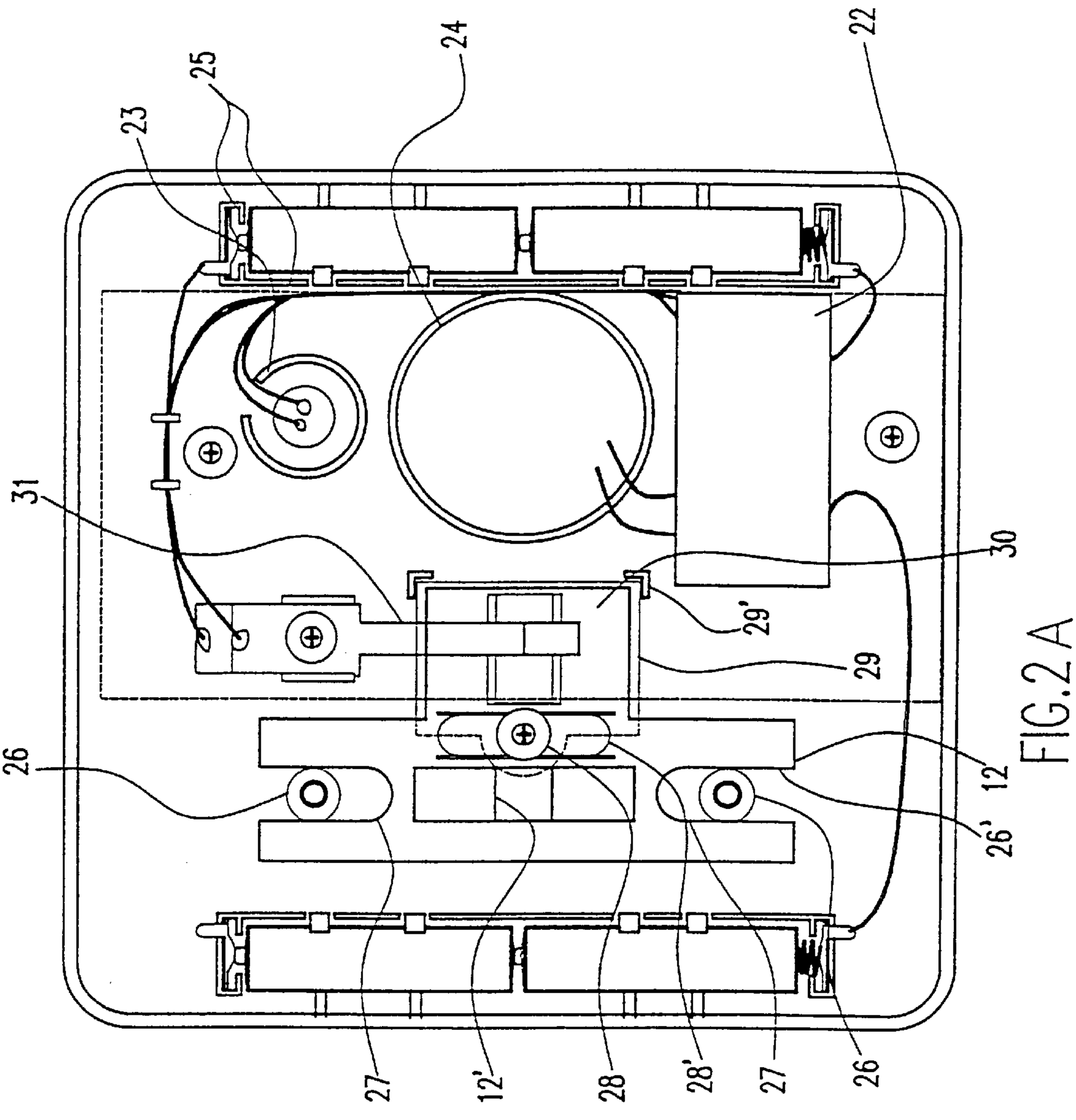


FIG.2A

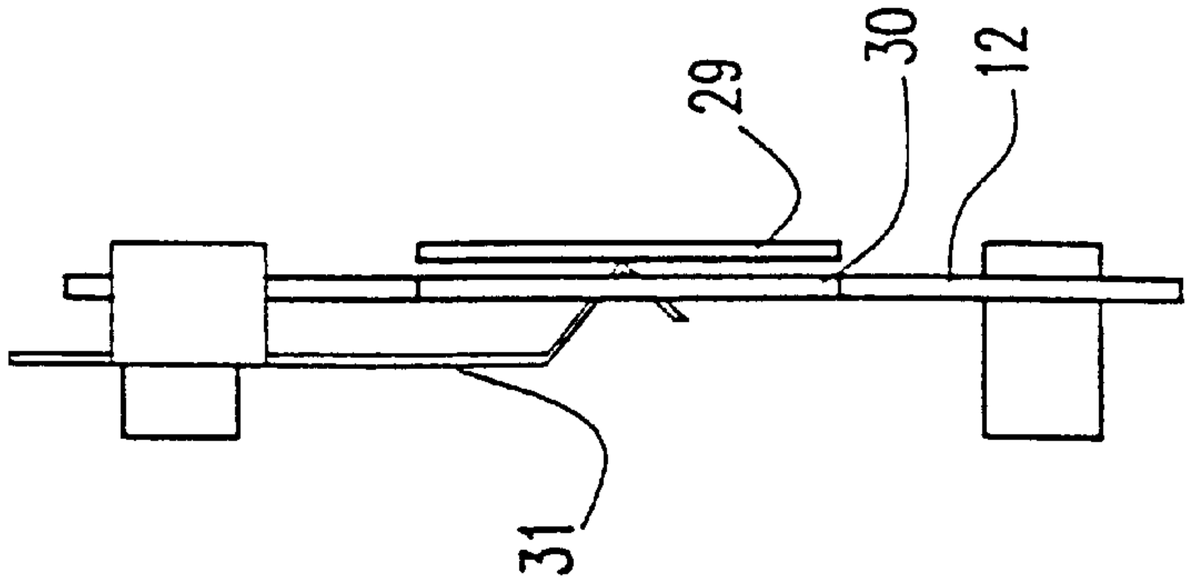


FIG.2C

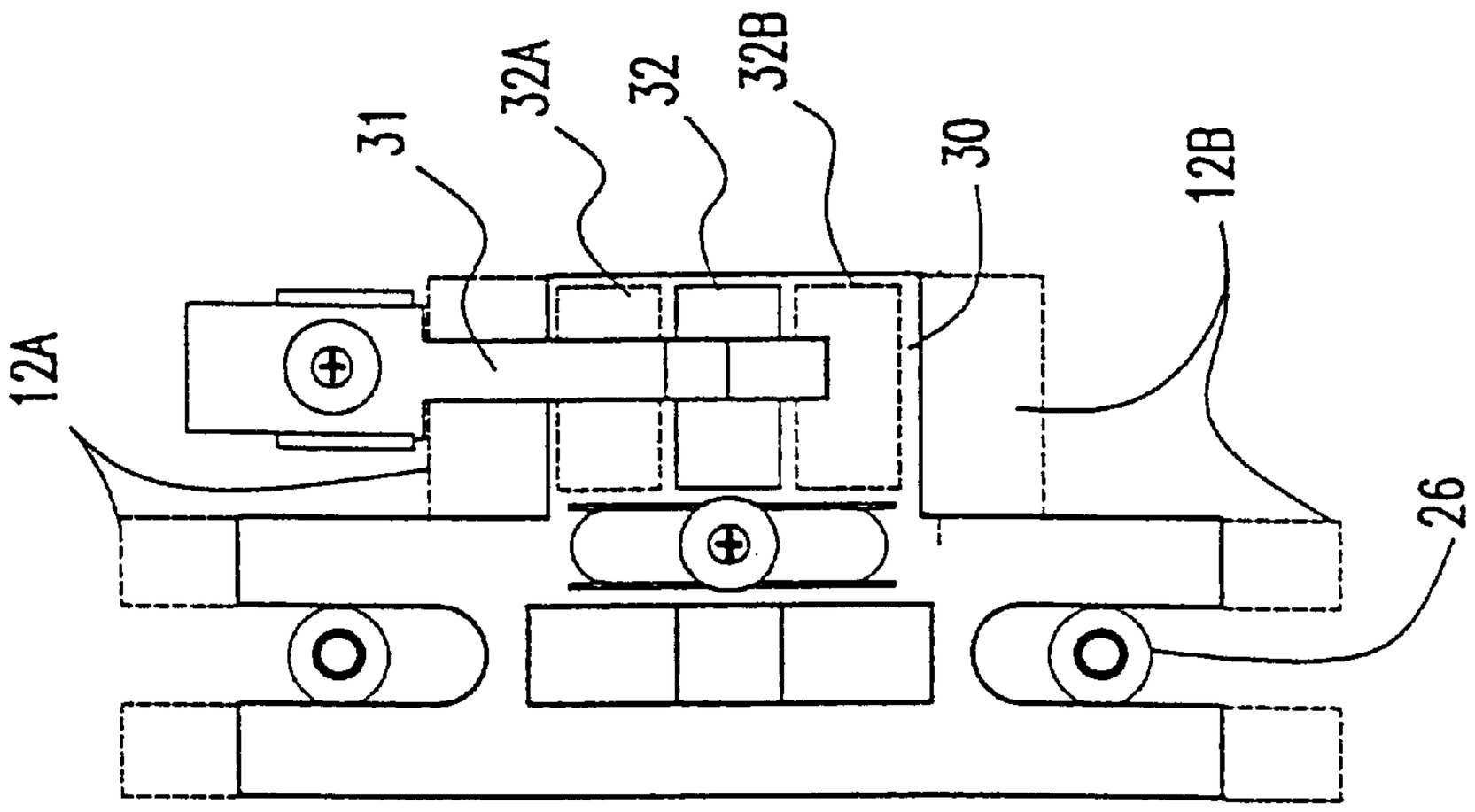


FIG.2B

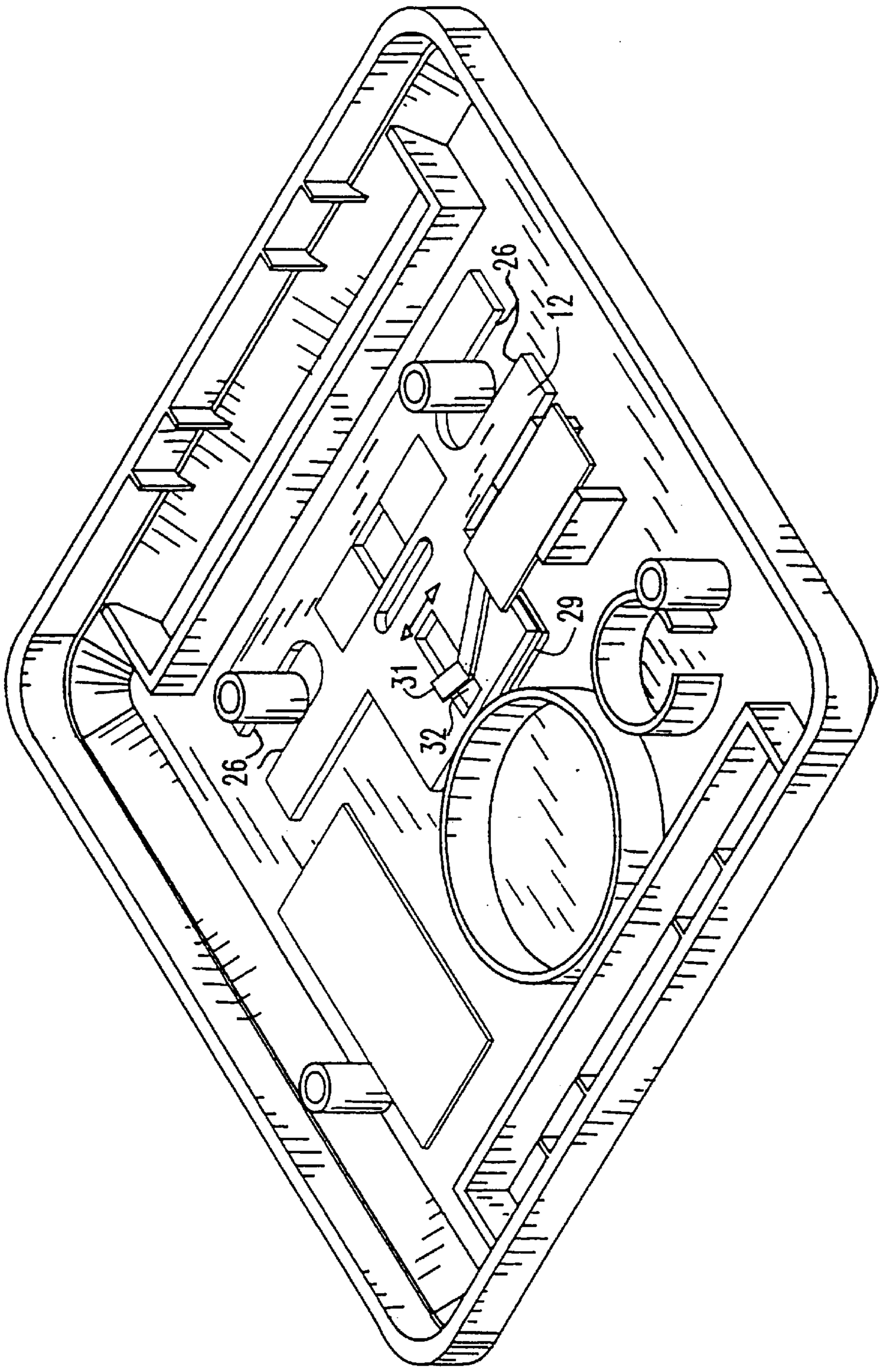


FIG.3

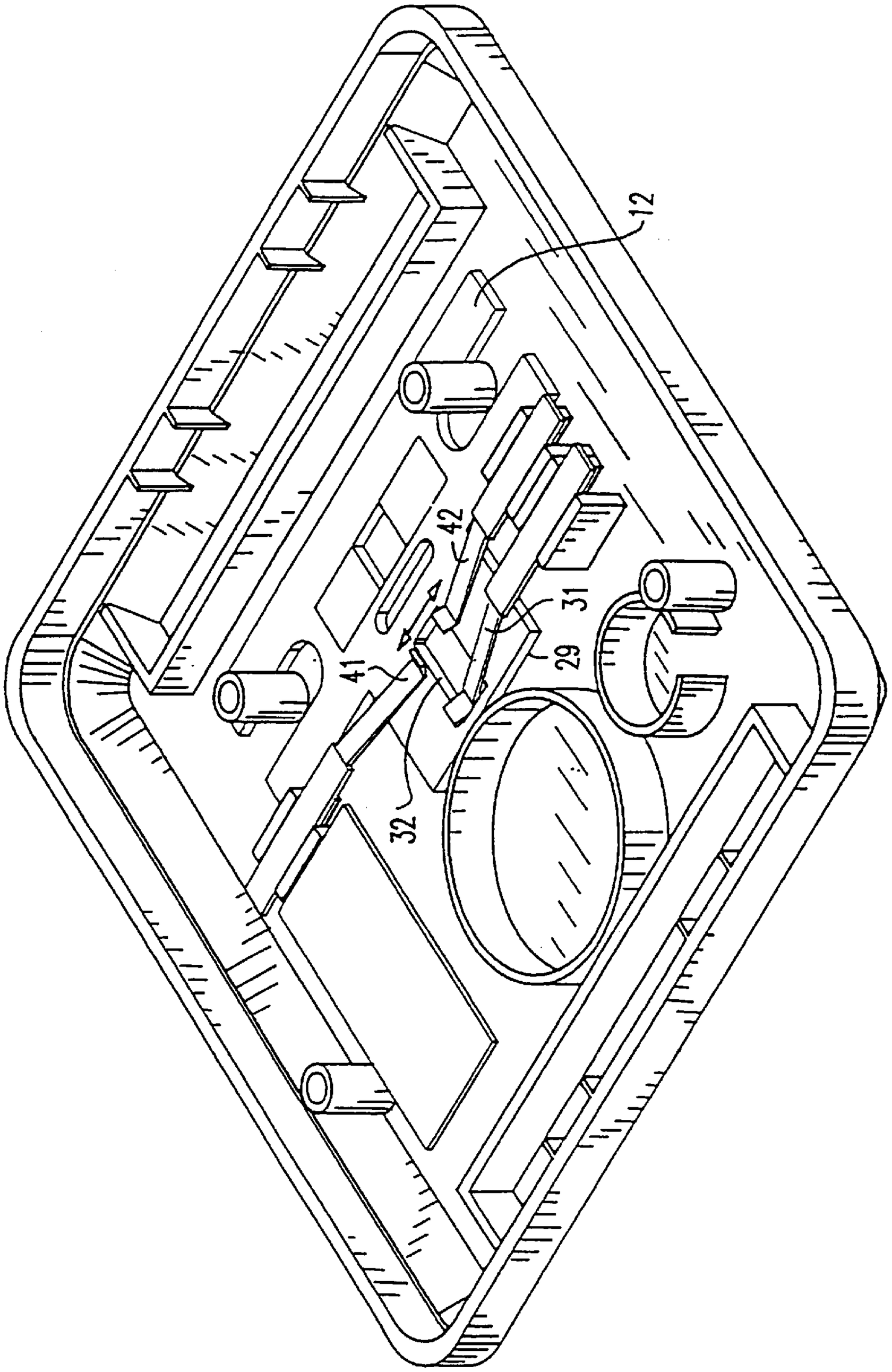


FIG.4

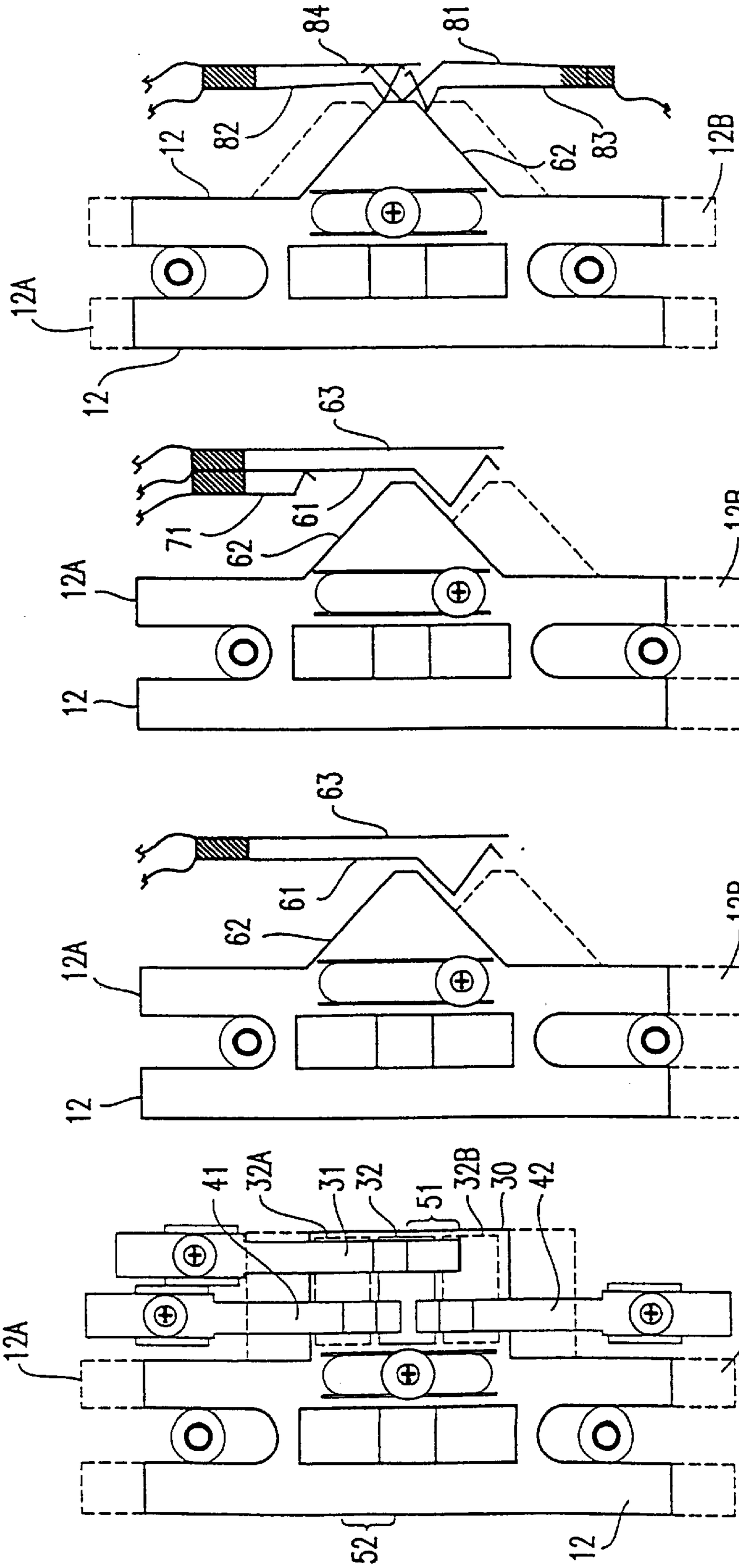


FIG.8

FIG.7

FIG.6

FIG.5

# MINIATURE MOMENTARY CONTACT SLIDING SWITCH

This is a divisional application of copending U.S. patent application Ser. No. 08/898,958, filed on Jul. 23, 1997, and now allowed as U.S. Pat. No. 5,871,086. This application is also a continuing application of copending U.S. patent application Ser. No. 09/122,721, Jul. 27, 1998 which is a still pending and a continuation application of U.S. patent application Ser. No. 08/685,609 filed on Jul. 24, 1996 and now abandoned.

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to switches for electronic and electrical apparatus and, more particularly, to miniature switches which are suitable for retrofitting electrical and electronic apparatus to other devices and controlling the electrical or electronic apparatus in conjunction therewith.

2. Description of the Prior Art

Control must be exercised over virtually all electronic or electrical apparatus in order to derive desired functions therefrom. To exercise such control, some device must provide an interface between the apparatus and some external agency such as a condition sensor or, much more often, a human operator. It is sometimes the case that control of a device will be desired in conjunction with operation or control of some other apparatus or system with which the device otherwise cooperates only minimally, if at all. In such a case, either operation or the control of the other apparatus or system must be sensed and converted to an electrical signal suitable for exercising the desired control of the device.

For example, it is known to sense current in one circuit and to control application of power to the another circuit. Thus, as applied in a commercially available power strip to an installation of a personal computer or audio system, the usually accessible power connection to, say, the monitor or the printer of a personal computer or the pre-amplifier, tuner or other component of an audio system, may be used to remotely control application of power to other components of the system where the individual switches therefor are not necessarily accessible or where the convenience of a single power switch for all system components is desired.

In other arrangements which involve separated but similar power sources such as in multi-pole circuit breakers or switches, a simple mechanical interlock between similar switch structures may be sufficient to commonly control separate circuits. In contrast, complex proximity sensing circuits (e.g. capacitive or radiant energy sensors) or signals representing changes in any of a number of different control functions of a device may be used in conjunction with knobs or keypads to provide an additional control function for the same or another device. For example, in some consumer electronics devices such as a car radio, adjustment of any control (e.g. volume) will cause temporary display of alternative data (e.g. tuner frequency rather than time) on a display. However, unless some structural or functional similarity or cooperation can be exploited, auxiliary switching or sensor arrangements are generally bulky, complicated, expensive and/or difficult to retrofit to existing apparatus or systems.

It has recently been proposed to provide a voice recording device in an electrical wall switch plate, such as is disclosed and claimed in U.S. patent application Ser. No. 08/685,609,



filed Jul. 24, 1996, of which the present inventor is a joint inventor and which application is hereby fully incorporated by reference as if the text thereof were fully set forth herein. In this combination, it is contemplated that the actuation of the wall switch should cause the playback of an audio message of one or more messages (possibly of a sequence of messages) that may be recorded at will, preferably by recording samples of the message in random access memory or other solid state memories.

Such recordation has been facilitated by recent reductions in cost of relatively large capacity semiconductor memories and integrated circuits capable of conversion of analog signals to digital signals and vice-versa. Thus, it is possible to provide the necessary electronics, including a speaker, microphone and battery power supply within a wall switch plate cover with only a relatively modest increase in the thickness thereof (e.g. about a 7/16 inch overall thickness, increasing thickness over a conventional switch plate generally by less than ¼ inch).

Incidentally, at the current state of design of this device, it is preferred to activate the playback function by a brief signal pulse with automatic reset of the playback circuit when the message playback is complete. Thus the preferred function of sensing actuation of the wall switch differs widely from the function of the wall switch itself or the circuit to which it is connected. Further, it is considered desirable to be able to distinguish between directions of actuation to provide different messages for each wall switch state or to control a sequence of messages. Sensing of circuit conditions may also be complicated by so-called three-way or four-way switch connections which may allow a circuit to be controlled from multiple locations potentially remote from the playback device.

However, providing sensing of operation of a wall switch as desired for this application within a switch plate cover is not trivial. The existing wall switch provides the mounting arrangement for the switch plate and conventional switch plates are designed to be drawn tightly against the body of the wall switch with virtually the entirety of the actuating lever of the wall switch protruding therethrough. Of course, external mechanisms would be unsightly and potentially dangerous.

Current sensing in the controlled circuit is less than fully reliable due to possible variation or disconnection of the load controlled by the switch and, in any event, it is desirable for purposes of simplicity and safety of installation of the device to retrofit it to an existing wiring system without disturbance of existing wiring in any way. Prevailing electrical codes may prohibit and restrict any incursion of any portion of the device or its circuitry into an existing electrical wiring box.

The need for linking of a switch or other structure to an existing electrical switch within a small volume is not limited to the device disclosed in the above-incorporated application. While many arrangements for operationally linking switches and electrical circuits are known, none are suitable for providing sensing of actuation and/or direction of actuation within a small thickness and within a wall switch cover plate with only a marginal increase in thickness thereof. Further, the required thinness of a switch may limit its ability to withstand thousands of actuations of the switch to which is to be connected.

## SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a very thin but mechanically robust switch and linkage

suitable for simple connection to the actuating lever of an existing electrical switch such as a wall switch and without requirement for modification of the existing electrical switch or contact with existing wiring.

It is another object of the invention to provide a momentary contact switch for sensing an intermediate location of an actuating lever of another switch.

It is a further object of the invention to provide a mechanically robust switch and linkage capable of sensing a direction of movement of an actuating lever of another switch at an intermediate location thereof between normal switch actuation positions.

In order to accomplish these and other objects of the invention, a momentary contact switch is provided comprising a support structure, a sliding plate having an aperture to engage an actuating lever of an electrical switch and slidable along a locus relative to the support structure, and an arrangement moveable with the sliding plate to control movement of a first electrical contact against a second electrical contact at a position intermediate between two extreme positions of said sliding plate.

In accordance with another aspect of the invention, a method of retrofitting apparatus such as a voice recording and playback apparatus to an electrical switch is provided comprising the steps of placing an aperture in a plate slidable relative to a support structure over an actuating lever of the electrical switch, attaching the support structure to the electrical switch, controlling movement of electrical contacts with the plate in accordance with the relative position of the plate and the support structure, and controlling the apparatus with said electrical contacts.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

FIG. **1** is a plan view of the front of a wall switch plate including a preferred recording and playback device and a switch in accordance with the invention,

FIG. **2**A is a plan view of the back of a wall switch plate including a preferred recording and playback device and a switch in accordance with the invention,

FIGS. **2**B and **2**C are plan and side views of a preferred form of the switch in accordance with the invention,

FIG. **3** is a perspective view of a preferred form of the switch and wall plate in accordance with the invention with recording and playback circuits removed,

FIG. **4** is a perspective view of a variant form of the switch of FIG. **2**A including provision for sensing direction of motion of an actuating lever of a switch to which it is connected,

FIG. **5** is a plan view of the variant form of the invention shown in FIG. **4**,

FIG. **6** is a plan view of a form of the invention functionally corresponding to FIG. **3** and employing a cam,

FIG. **7** is a plan view of a modified form of the switch of FIG. **6**, and

FIG. **8** is a plan view of a form of the invention functionally corresponding to FIG. **3** and employing a cam.

## DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings, and more particularly to FIG. **1**, there is shown, in plan view, the front of a wall switch cover plate **10** including a voice recorder in accordance with a preferred application of the invention. The switch plate includes an aperture **11**, preferably tapered or bevelled about the periphery thereof through which an actuating lever of an existing conventional wall switch (not shown) may protrude, passing through a portion of a sliding plate **12** supported by cover plate **10** with an aperture **12'** therein which thus engages the actuating lever of the existing wall switch, schematically illustrated and indicated by the same reference numeral. Apertures **14** are provided for mounting the wall switch cover plate **10** to the existing wall switch in the conventional fashion. To conceal the slightly increased thickness of the cover plate and provide an aesthetically pleasing appearance as well as efficiently housing conventionally shaped batteries therein, the edges thereof are preferably bevelled or rounded as shown at **15** in a manner not at all critical to the practice of the present invention.

An opening **16** is preferably provided to facilitate acoustic coupling to a miniature microphone placed behind it. The opening can be formed in a manner to resemble the head of a mounting screw, as illustrated, if desired. Further apertures **18** are provided as a grille for a miniature speaker which can be mounted behind it and a button **20**, which can also be made to resemble a head of a mounting screw, is also provided to control the recording function.

Referring now to FIG. **2**A, the back side of the wall switch cover plate **10** is shown in plan view. Mounting arrangements for the electronics board (**22**), microphone (**23**), speaker (**24**) and batteries (**25**) are preferably provided as molded bosses but are not critical to the practice of the invention. In the same manner, stand-off bosses **26** are provided to accommodate the thickness of sliding plate **12** and to provide bearing surfaces therefor. Accordingly, when the actuating lever of an existing wall switch engages aperture **12'** in sliding plate **12**, cut-outs **27** bear against bosses **26** to constrain movement of sliding plate **12** along a preferably linear locus. Additionally, the sliding plate **12** is assembled to the cover plate **10** with a screw, washer and insulating bearing washer (all generally indicated at **28**) through slot **28'**. The insulating washer serves to retain contact plate **29** in position against the cover plate and positioned by preferably molded bosses **29'**. It should be understood that the contact plate could also be a fixed contact mounted as part of a switch including moveable contact **31**. Electrical connection to contact plate or fixed contact **29** may be made in any desired manner, conveniently in the same direction and under contact **31** as illustrated in FIG. **2**A. Alternatively, adhesive or other expedients may be used to attach the contact plate **29** in place.

Sliding plate **12** also carries a switch mask portion **30**, also shown in FIG. **2**B. It should be appreciated that the position of sliding plate **12** depicted in FIG. **2**A relative to cover plate **10** (and in FIG. **2**B relative to bosses **26**) corresponds to an intermediate position of the existing wall switch with which it is intended to cooperate. Therefore, the actuated or operative positions of the existing wall switch bring sliding plate **12** to one of the extreme positions indicated by dashed lines **12**A or **12**B.

The switch in accordance with the invention is formed by contact plate **29**, shown in FIGS. **2**A and **2**C and a conductive contact **31** shown in all of FIGS. **2**A–**2**C, preferably of a cantilevered form illustrated but not critical to the invention. It should be further appreciated that a further aperture **32** in sliding plate **12** allows contact between contact **31** and contact plate **12** when sliding plate **12** is in the intermediate position between operative positions of the actuating lever

of the existing switch. In either of these operative positions of the existing switch, aperture **32** is moved to either position **32**A or **32**B (corresponding to the extreme positions **12**A and **12**B, respectively, of the sliding plate **12**) and the mask portion **30** of sliding plate **12** thus serves to insulate contact **31** from contact plate **29**. Accordingly, as perhaps more clearly shown in FIG. **3**, the switch formed by sliding plate **12** and contacts **29** and **31** provides a momentary contact as the actuating lever of the existing switch is moved between operative positions.

It should further be appreciated that sliding plate **12** has robust bearing surfaces **26**' which bear against bosses **26** and the separation between them is long in comparison with the separation of mask portion **30** from the axis between them. Therefore, the sliding plate mechanism **12** is not susceptible to binding. Likewise, mask portion **30** can bear directly against contact plate **29** and be supported thereby as it is driven between contact **31** and the contact plate **29**. The edges of aperture **32** can be bevelled, if desired, to assist in the ease with which contact **31** can be separated from contact plate **29** and preferably works against only the small force exerted by the relatively long cantilever of contact **31** (which is, of course sufficiently long that only elastic deformation of the cantilever will occur over the small thickness of sliding plate **12**). Therefore, the switch of FIGS. **1–3** is extremely reliable and robust and need be no thicker than the contact plate **29** (which could, in theory be formed by a foil or a plated layer), the small thickness of sliding plate **12**, and enough curvature or other shaping in cantilever **31** to accommodate that small thickness. In essence, the total required thickness of the switch is only twice the thickness of the sliding plate **12** plus the thickness of contact **31**. It should be noted in this regard that the relatively wide areas of the mask portion **30** of sliding plate **12** provide a substantial degree of stiffness to resist deformation around the aperture **32** even if sliding plate **12** is very thin and of a relatively flexible material.

From the foregoing, it is seen that the preferred form of the invention provides a mechanically reliable and robust basic momentary contact switch design of minimal thickness which can be refined in many ways by those skilled in the art in view of this description thereof. Bearing surfaces can be provided by readily available insulative and abrasion-resistant materials which will provide a long serviceable lifetime under the extremely light loads inherent in the design are readily available. Additionally, lubrication can be provided and renewed from time to time at bosses **26** and contact plate **29**. It should also be noted that the only moving part of the switch other than the slight elastic deformation of the contact **31** is slidable plate **12** which is inexpensive and could be easily renewed since it is held in position over bosses **26** only by a single screw **28**.

A preferred variant form of the invention which can provide discrimination of direction of motion of the existing switch actuating lever can best be understood from a comparison of FIG. **4** with the similar view shown in FIG. **3** discussed above. In this variant form of the invention, contact plate **29**, contact **31** and aperture **32** in sliding plate **12** are functionally identical to the embodiment of FIG. **3** although the size, form and placement thereof may be varied to accommodate additional contacts **41** and **42**.

It will be recalled from the foregoing that the recording and playback device **22** of the preferred application of the invention is arranged to begin operation in response to a momentary pulse and resets itself for another operation when an operation is complete. Therefore, the recording and playback device **22** will not respond to a further pulse during an operation. While the preferred configuration of the variant form of the invention illustrated in FIG. **4** exploits this function of recording and playback device **22** so that only the first of two momentary contacts is recognized, other mechanical configurations or electrical logic circuitry provided to achieve a the same or other desired function.

For example, while the embodiment illustrated in FIG. **4** has contacts **41** and **42** placed such that all of contacts **31**, **41** and **42** are separated from contact plate **29** in either extreme position of sliding plate **12**, contacts **41** and **42** could be more widely separated to be in contact with contact plate **29** at an extreme position of sliding plate **12** and, for example, a capacitor charging circuit connected to each of contacts **41** and **42** such that a respective capacitor will be discharged through contact **31** as sliding plate **12** moves through the intermediate position and while both contacts **41** and **42** are separated from contact plate **12**. Alternatively, only contacts **41** and **42** need be provided in combination with an electrical connection to contact plate **29** to provide an input to a logic circuit which can similarly discriminate which of contacts **41** and **42** contacts contact plate **29** earlier or later than the other.

In this way, only one pulse will be produced for each movement of sliding plate **12** but different directions of movement will produce that pulse at a different node of the circuit and can thus be discriminated. It will be appreciated from the foregoing that other functions could also be achieved by providing additional or differently shaped apertures **32** in mask portion **30** of sliding plate **12** as well as additional switch poles and may be found desirable or convenient.

Referring now to the plan view of the variant form of the invention of FIG. **4** shown in FIG. **5**, the direction discriminating function thereof will now be explained. In either extreme position **12**A or **12**B of sliding plate **12** aperture **32** will be at locations **32**A or **32**B respectively, at which all contacts **31**, **41** and **42** will be separated from the contact plate **29** by the interposition of the mask portion **30** of sliding plate **12**. In a central intermediate position, depicted in solid lines, only contact **31** will be in contact with contact plate **29** and contacts **41** and **42** will be separated from the contact plate **29** by the edge of aperture **32**.

Between each extreme position **12**A, **12**B, and the central intermediate position there will be a position indicated by bracket **51** of sliding plate **12** at which two contacts will be allowed to simultaneously be in contact with contact plate **29** while one of contacts **41** and **42** will be separated therefrom by the mask portion **30** of the sliding plate **12**. While another such position, indicated by bracket **52**, will occur before the opposite extreme position is reached, simultaneous connection of two contacts with or through contact plate **29** will always occur before the other as the existing switch lever is moved between operative positions. Thus, the direction of movement on the existing switch lever can be readily discriminated by detection of the earlier (or later) connection of contact **41** or **42** with contact **32**.

As alluded to above, the embodiments of the invention illustrated in FIGS. **3** and **4** rely on elastic deformation of contacts **31**, **41**, **42**, (e.g. by being cantilevered) as they are separated from contact plate **29** by the mask portion **30** of sliding plate **12** such that they will return to their original shape to contact the contact plate **29** when allowed to do so by the aperture **32**. While preferred for thinness and economy of manufacture and/or repair, robustness of the switch may be enhanced by providing for positive contact movement and engagement as will now be discussed for

different forms of the invention illustrated in FIGS. **6–8**. It should be understood, however, that positive contact and increased robustness is achieved at a cost of the positive separation of contacts in the above-described embodiments and may require, in practical implementations, increased stiffness of contacts and consequent increase in actuation force and susceptibility to wear. However, in applications not subject to accelerations such as with a wall switch, maintaining separation may not be a problem and relatively thin resilient contacts may be employed.

Referring first to FIG. **6**, an embodiment of the invention having a momentary contact function corresponding to that of the embodiment of FIG. **3** is shown. Essentially, the embodiment of FIG. **6** (and FIGS. **7** and **8**, as well) use a cam **62** for providing positive contact instead of an aperture **32** which provides positive separation. Thus, as sliding plate **12** moves from one extreme position **12**A, shown in solid lines, to the other extreme position **12**B, shown in dashed lines, cam **62** will be brought into contact with contact **61** and urge it against contact **63** which functions in the same manner as contact plate **29** of the embodiment of FIGS. **3** and **4**.

Similarly in FIG. **7**, cam **62** momentarily bears against contact **61** to urge it against contact **63** while separating it from contact **71** as the sliding plate **12** moves between extreme positions **12**A and **12**B. It should be appreciated that the switch function of simultaneously opening one pair of contacts while closing another is readily achieved with a cam structure. The same function can also be achieved using an aperture **32** as in the embodiments of FIGS. **3** and **4** but may require additional apertures or shaping of the edges of aperture **32** to obtain the desired function, as will be evident to those skilled in the art in view of this description.

The embodiment of the invention shown in FIG. **8** corresponds to the switch function of the variant form of the invention shown in FIG. **4**. Specifically, in FIG. **8**, sliding plate **12** is shown between an extreme position **12**A, **12**B, and a central intermediate position at which both contacts **81** (corresponding to contact **31** of FIG. **4**) and **82** (corresponding to **41** of FIG. **4**) are brought into contact with contact **84** (corresponding to contact plate **29** of FIG. **4**). Similarly, in the central intermediate position, only contact **81** will be in contact with contact **84** and in an extreme position, none of contacts **81**, **82** or **83** will contact the contact **84**. Thus, as in the embodiments of FIGS. **6** and **7**, the embodiment of FIG. **8** also provides momentary contact but additionally provides for discrimination of direction of movement in the manner described above in regard to FIG. **4**.

It should be understood in regard to the embodiment of the invention illustrated in FIG. **8** that separate contacts **84** can be provided for any desired ones of contacts **81–83** as may be desired and additional contacts corresponding to contact **71** of FIG. **7** may be provided as desired. Additionally, separate cams **62** could be provided for any or all contacts **81–83** in the same manner that the edges of aperture **32** may be adjusted to alter switch functions or plural apertures **32** provided.

It should also be appreciated in regard to the embodiments of FIGS. **6–8** that the location of the cam **62** is not critical to the invention. For example, cam **62** could be provided on the front or back side of sliding plate **12**. However, such a location would result in greater switch thickness and may require other structural adjustments such as provision of bearing surfaces, additional stiffness of the sliding plate **12** and the like, as will be apparent to those skilled in the art.

It should also be appreciated that all of the above disclosed embodiments of the invention can accommodate differing amounts of movement of an existing switch actuating lever or other moveable structure by virtue of the momentary contact function at an intermediate location between extreme positions and thus is applicable to a wide variety of switches made by different manufacturers. Any length of movement can be accommodated by design of the length of slots **27** and **28**'.

In view of the foregoing, it is seen that the invention provides a plurality of momentary contact switch functions including discrimination of direction of movement at an intermediate position in a robust switch structure which can be very thin and economically manufactured and/or repaired. The switch can be retrofitted to an actuating lever of an existing switch or other moveable structure without modification of the switch or other structure or disturbance of existing wiring to detect operation of, for example, an electrical light controlling circuit and to coordinate operation of another device such as a sound recording and playback device therewith.

While the invention has been described in terms of a single preferred embodiment and variations thereon, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.

What is claimed is:

**1**. A momentary contact switch comprising

a support structure,

a sliding plate having an aperture to engage an actuating lever of an electrical switch, said sliding plate being slidable along a locus relative to said support structure, and

means for closing and opening a circuit, said means for closing and opening closes the circuit when a first electrical contact contacts a second electrical contact through an aperture of said means for closing and opening and when said sliding plate is at a position intermediate between two extreme positions of said sliding plate and said means for closing and opening opens the circuit by separating said first electrical contact from said second electrical contact when said sliding plate is at said two extreme positions of said sliding plate, said means for closing and opening moving with said sliding plate.

**2**. A momentary contact switch as recited in claim **1** wherein said second electrical contact is a contact plate.

**3**. A momentary contact switch as recited in claim **1**, further including a third electrical contact and wherein said means for closing and opening moves said first electrical contact away from said third electrical contact.

**4**. A momentary contact switch as recited in claim **1**, further including a pair of contacts spaced from each other in the direction of sliding motion of said sliding plate.

**5**. A momentary contact switch as recited in claim **1**, further including another contact spaced from said first contact in the direction of sliding motion of said sliding plate.

**6**. A momentary contact switch as recited in claim **1**, wherein said support structure includes retaining means for retaining said actuating lever of said electrical switch in said aperture of said sliding plate to retrofit said momentary contact switch to said electrical switch.

**7**. A momentary contact switch as recited in claim **1**, wherein said to means for closing and opening opens the circuit when said sliding plate is at the two extreme positions such that said aperture of said to means for closing and opening is at a position such that said first electrical contact does not contact said second electrical contact.

* * * * *